

The tables given by Dr. Wadsworth are not complete, but so far as they go they show that "in mining engineering the leading schools in the world, so far as shown from the records here published, are Freiberg, Leoben, Clausthal, Berlin, Paris, St. Etienne, Schemnitz, Przibram, Michigan College of Mines, California, Columbia, Lehigh, Massachusetts Institute of Technology, and Colorado."

AN account of the proposed Institute of Scientific Research for India, which Mr. J. M. Tata, of Bombay, has undertaken to endow with an annual income of a lakh and a quarter (125,000 rupees), is given by Sir Henry Acland in the second edition of his little volume, "Medical Missions in their Relation to Oxford" (London: Henry Frowde). As already announced, it is intended to found an institution which shall be, or correspond to, a Teaching University for India, concerning itself principally with post-graduate studies and scientific research. A committee has been organised to take the matter in hand and appeal for funds; and Mr. Tata's commissioner, Mr. B. J. Padshah, is making inquiries in Great Britain, in Europe, and in the United States, how best to carry out the scheme. Sir Henry Acland utilises the opportunity which the proposed scheme affords to accentuate his appeal that "a generous benefactor, or some great National Company, should complete in Oxford the Public Health Department for University Education in the subject of public health and anthropology, with special reference to Mr. Jamsetji M. Tata's great scheme for natural science in general, and sanitary science in particular, in India."

AN exhibition of practical work executed by candidates at the recent examinations of the City and Guilds of London Institute was opened at the Imperial Institute, on Friday, by the Duke of Devonshire. Referring to the character of the instruction given under the direction of this institute, His Grace remarked: The object of this instruction is to familiarise a student with all the processes and all the details the use of which is required in the trade he is going to undertake, and to show to him how the knowledge he has acquired in lectures or in books may be applied to the practical performance of his business. This exhibition, I hope, will help those who see it to realise the real need of the technical instruction now being given. If you sent students direct from the classes of the Science and Art Department into a workshop they would be utterly incapable, in all probability, of applying in a practical way the knowledge which they have acquired in the classes. If you separate by too long an interval the lecture-room from the workshop, the work will be lost, but if you combine the lecture-room with the workshop, you have the material from which we may reasonably expect that expert finished artisans will be provided, although, of course, perfect workmen can only be produced by long and continuous practice. The artisan students in the registered classes of the institute now number over 34,000, in addition to nearly 2000 students in its manual training classes, and of these numbers 13,800 were examined last year, showing an increase of 800 over any previous number.

## SOCIETIES AND ACADEMIES.

LONDON.

**Royal Society**, April 20.—"Note on the Fertility of different Breeds of Sheep, with Remarks on the Prevalence of Abortion and Barrenness therein." By Walter Heape, M.A., Trinity College, Cambridge. Communicated by W. F. R. Weldon, F.R.S.

The paper is a brief abstract of information obtained from 397 sheep-breeders, who have supplied records of flocks containing 122,673 ewes for the breeding season of 1896-7.

The information obtained referred especially to the following eight pure breeds of sheep: Suffolk (7506 ewes), Kent (9931), Southdown (9134), Hampshire (26,400), Oxford Down (3555), Dorset Horn (10,285), Shropshire (8492), Lincoln (17,880). Besides these, returns were received for a small number of flocks for each of ten other pure breeds, referred to below as "various pure breeds" (10,010), and for certain cross-bred flocks (19,480).

**Fertility.**—The importance of fertility as a factor in the survival of a species is referred to, and some of the influences attending domestication which tend to reduce that importance are pointed out. Reference is made to Prof. Karl Pearson's account of the racial characteristic of fertility in the human

species, and it is demonstrated that, in spite of the equalising effects of domestication, fertility in different breeds of sheep is also of a racial character.

Owing to the fact that the returns supplied by flock-masters of the number of lambs born are admittedly not always correct, and in view of the fact that the record of twins produced is considerably more accurate, statistics of the latter have been chiefly utilised for generalisations regarding fertility. These records show that the pure breeds dealt with stand in the following order:—

Suffolk (52.22 per cent. of twins), Shropshire (46.84), Dorset Horn (37.55), Oxford Down (35.02), Kent (31.38), Lincoln (29.09), various pure breeds (28.09), Hampshire (24.09), Southdown (18.67); that the average percentage of twins for these breeds is 30.02; and that the cross-bred flocks produce 31.04 per cent. of twins.

From this return, it is seen that the value of the Suffolk and Shropshire breeds, as prolific breeds, is incontrovertible, while the records of the Southdowns is so low as to show urgent need for close attention to the subject on the part of breeders. It is to be noted that several of the pure breeds show a higher rate of fertility than the cross-bred flocks.

The fertility of certain of the pure breeds is then examined with regard to locality, and it is demonstrated that while locality may affect the fertility of a breed, it does not do so to a sufficient extent to alter the racial characteristic of the fertility of the breed. The chief possible exception to this is found among flocks of Lincoln sheep kept in Yorkshire, in which the percentage of twins recorded is practically double the percentage obtained in the home county; but it is pointed out that, in this case, there are circumstances which indicate the difference is due to an abnormally low percentage of fertility in the Lincolnshire rather than to an especially high rate of fertility in the Yorkshire flocks.

The influence of management, of the condition, kind and amount of food available, of the season, weather, subsoil, and the age of breeding ewes upon the fertility of a flock was referred to.

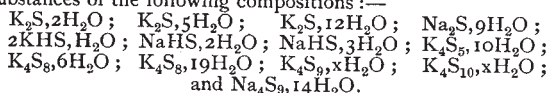
Considering the percentage of lambs produced by the pure-bred flocks individually, it is seen that the percentage ranges, in 306 flocks, from 203.8 to 59.09 per cent., the most frequent percentage being between 110 and 120 per cent.

As regards the different breeds, the most prominent points demonstrated by this inquiry are the value of the Suffolk breed from a point of view both of fertility and low rate of loss from abortion and barrenness; the unsatisfactory condition of Southdowns, both as regards fertility and loss; the urgent need for investigation of the fertility of Dorset Horn ewes with rams of their own breed; and of the conditions affecting both fertility and loss in flocks of Lincolns in the home county.

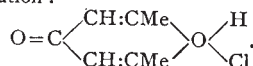
**Physical Society**, June 9.—Prof. Lodge, President, in the chair.—The Secretary read a paper, by Mr. C. G. Lamb, on the distribution of magnetic induction in a long iron bar. A Lowmoor iron rod, whose length was 250 times its diameter, was taken, and a B-H curve plotted by ballistic measurements made with a search coil at the centre of the bar. The search coil was then moved along the bar, and the distribution of induction was determined for magnetising forces varying from  $H = .74$  to  $H = 35.0$ . Up to fields of 3.35 the induction leaks out more and more quickly as  $H$  increases, but above this value the induction tends to keep in more and more. From the curves obtained, the mean induction was deduced as well as the distance of the resultant pole from the middle of the bar. It is shown that this distance first decreases and then increases with the rise in field strength. According to the ellipsoidal theory, it should be constant. The bar was then made into a ring, and the B-H curves again determined. From these curves, together with known relations between  $B$ ,  $H$  and  $\mu$ , curves showing the variation of  $\mu$  along the bar were constructed. The Chairman gave a general explanation of the way the leakage depended upon the permeability in the case of a long iron bar.—A paper on the absolute value of the freezing point was read by Mr. Rose-Innes. The corrected values of the absolute value of the freezing point determined by Lord Kelvin from experiments on hydrogen air and carbonic acid contain discrepancies amounting to 1/3 per cent. between the carbonic acid and the hydrogen, while the separate measurements for carbonic acid agree among themselves to about 1/6 per cent. Starting with Lord Kelvin's equation for the forcing of a gas through a plug, the author has obtained a formula for the ab-

solute value of the freezing point, which can be worked out from the experimental researches of Regnault. The formula is based on the experimental proof by Joule and Kelvin, that the ratio between the cooling effect per atmosphere of differential pressure and the pressure is constant for all pressures. Applying data from Regnault's experiments to the formula deduced by the author, the values of the freezing point are practically the same as those given by Lord Kelvin. Hence it is thought probable that the discrepancies are due to inaccuracies in the experiments of Regnault which were conducted at constant pressure. The value of the zero calculated from experiments on hydrogen at constant volume made by M. Chappuis is, if we treat hydrogen as a perfect gas, 273.034. Applying a thermodynamic correction for the deviation of hydrogen from the laws of a perfect gas, the value of the freezing point becomes 273.19. This figure agrees very closely with the value 273.14 obtained by Lord Kelvin from the constant pressure experiments on air. The correction has only been applied to hydrogen, because in this case it is so small that a large percentage error in its determination has a very small effect upon the absolute value of the freezing point. In constant pressure work the experiments are difficult to carry out, and the correction is easily applied, while in constant volume work the experiments are easily performed, and the thermodynamic correction is difficult to apply. Prof. Gray expressed his interest in the manner in which Mr. Rose-Innes had obtained his results without using the experimental data of Joule and Kelvin, and pointed out that Lord Kelvin attached most importance to the results he had obtained for air. It would be useful to have the gas constants redetermined with greater accuracy. The compensating arrangement devised by Prof. Callendar would enable experiments at constant pressure to be carried out satisfactorily. Dr. Lehfeldt drew attention to the sign of the correction applied by the author, and asked if it should not be negative instead of positive. He pointed out that variation in the specific heat of a gas might affect the formula, and said that Boltzmann had shown that it was impossible to determine an absolute temperature without introducing calorimetric measurements. As Joule and Kelvin had sometimes found positive and sometimes negative values for the cooling effect in the case of hydrogen, large percentage errors might occur in the value of the correction. Mr. Blakesley asked what the probable error was in the numbers given by Lord Kelvin. Mr. Watson said that the author had calculated the value of the freezing point from experiments on hydrogen, and had shown that the result agreed closely with the value of the zero deduced by Lord Kelvin from experiments on air. He would like to know what agreement would be got by applying Mr. Rose-Innes' correction to the case of air. Mr. Rose-Innes, in replying, said he agreed with Prof. Gray that it would be useful to have the constants redetermined. It was only in their early work that Joule and Kelvin observed a cooling effect for hydrogen, the bulk of the experiments giving a heating effect. The sign of the correction depended on the increase or decrease of the effect with temperature, and was positive in the case of hydrogen. Regnault has proved experimentally that the value of the specific heat is constant.

**Chemical Society, June 1.**—Dr. W. H. Perkin, Vice-President, in the chair.—The following papers were read:—The hydrosulphides, sulphides and polysulphides of potassium and sodium, by W. P. Bloxam. The author has prepared substances of the following compositions:—

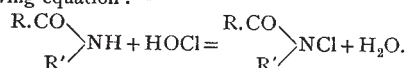


—On the relative efficiency of various forms of still-head for fractional distillation, by S. Young. The author has tested the efficiency of a number of forms of still-head in common use, and has devised new forms of greater efficiency.—The salts of dimethylpyrone and the quadrivalence of oxygen, by J. N. Collie and T. Tickle. The authors consider that dimethylpyrone chloride contains tetravalent oxygen, and has the following constitution:—



—The symmetrical di-isopropylsuccinic acids, by W. A. Bone and C. H. G. Sprankling. By the action of isopropyl bromide on ethyl sodioisopropylcyanosuccinate and subsequent hydro-

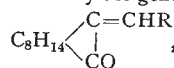
lysis of the ethereal salt produced, the authors have obtained *cis*- and *trans*-di-isopropylsuccinic acid; the dissociation constants have been determined.—Active and inactive phenylalkoxyacetic acids, by A. McKenzie. Phenylalkoxyacetic acids, in which the alkyl group is either ethyl, methyl, propyl or isopropyl, have been prepared from *lævo* and inactive mandelic acid; in some cases racemation occurs.—The chemical composition of the oleo-resin of *Dacryodes hexandra*, by A. More. The oleo-resin of *Dacryodes hexandra* contains *lævo*-pinene, *lævo*-sylvestrene, a resin and a white crystalline substance which is probably illicic alcohol.—The condensation of ethyl acetonedicarboxylate: the constitution of triethyl orcintricarboxylate, by D. S. Jerdan. The author has obtained a diethyl orcintricarboxylate as a new condensation product of ethyl acetonedicarboxylate; the diethyl- and triethyl-salt both yield derivatives of two orcintricarboxylic acids, so that the constitution of triethyl orcintricarboxylate is determined.—A series of substituted nitrogen chlorides, by F. D. Chattaway and K. J. P. Orton. The authors have prepared a number of substituted nitrogen chlorides by aid of a reaction represented by the following equation:—



**Royal Microscopical Society, May 17.**—Mr. E. M. Nelson, President, in the chair.—Mr. C. L. Curties exhibited and described a new electrically heated stage for the microscope, made by Reichert. It was constructed so as to be heated by the current from the ordinary electric lighting supply. By an ingenious automatic arrangement the stage could be maintained at any required temperature to within 0.1° C.—Messrs. Watson and Sons exhibited a form of dissecting stage, designed by Mr. T. G. West, which could be used with any microscope without damaging the stage of the instrument when doing rough work.—The President called attention to some beautiful photographs of Mr. Grayson's rulings, taken by Mr. Wedeles.—Dr. Sorby's communication not being forthcoming, the President read a paper on the fine adjustment. He described the various forms which had been adopted from time to time, and said that in the course of his investigations he had discovered that Varley's inventions had been ascribed to others, and that the long lever fine adjustment generally ascribed to Ross was really first made by Powell.—The President then called attention to the exhibition of "pond life" by Fellows of the Society and Members of the Quekett Microscopical Club.

## PARIS.

**Academy of Sciences, June 5.**—M. van Tieghem in the chair.—On the development in series of the integrals of differential equations by Cauchy's method, by M. Emile Picard.—Remarks on the formation of alcohol and carbonic acid, and on the absorption of oxygen by the tissues of plants, by M. Berthelot. Some remarks on a note in the previous number of the *Comptes rendus*, by M. A. Devaux. M. Berthelot recalls some experiments on the formation of alcohol made by him in 1860, and emphasises the necessity of very careful manipulation in experiments of this nature. Thus the alcohol may be driven off by a current of hydrogen at 110°, if the carbon dioxide is to be determined, or in a rapid current of steam if the isolation of the alcohol only is aimed at. If the manipulation of the leaves is not carried out as rapidly as possible, alcohol is readily formed during the process.—On the molecular refractions, molecular dispersion, and specific rotatory power of the combinations of camphor with some aromatic aldehydes, by MM. A. Haller and P. Th. Müller. The substances studied would be represented by the general formula



where R was C<sub>6</sub>H<sub>5</sub>, C<sub>6</sub>H<sub>3</sub>O<sub>2</sub>CH<sub>3</sub>, C<sub>6</sub>H<sub>4</sub>(C<sub>3</sub>H<sub>7</sub>), and C<sub>6</sub>H<sub>4</sub>(OCH<sub>3</sub>). The results of the experiments are given in a table showing the molecular refractions of each of these substances for the rays Na, H<sub>a</sub>, H<sub>b</sub>, H<sub>c</sub>, the molecular dispersion, and the specific rotatory power ( $\alpha_D$ ) at 20°, all determined in toluene solution. Both the molecular refractions and dispersions deviate strongly from the values calculated from the usual moduli, and this peculiarity is still more marked in the specific rotatory power, which for camphor is about 42°, and for these aldehyde camphors is of the order of 500°.—Construction of a plane mirror of 2 metres diameter by mechanical methods, by M. P.



Gautier.—Stellar photographs taken with the large telescope of the Observatory of Meudon, by M. H. Deslandres. The telescope used had a great focal length (25 times the aperture, 60 cm.); the photographs taken of the moon, Jupiter, Saturn, and nebulae are said to compare well with the earlier work of Pickering, Scheiner, and Lord Rosse.—Remarks on the preceding communication, by M. J. Janssen.—On the determination of reference points in the spectrum, by M. Maurice Hamy.—On indeterminate equations of two or three variables which have only a finite number of solutions in prime numbers, by M. Edmond Maillet.—On the partial differential equations of the second order with real characteristics, by M. J. Coulon.—On the calculation of the constant of rectilinear diameters, by M. E. Mathias. The method given for the determination of the constant  $\alpha$  is applied to the observations of Knitsch on chlorine. The value of the constant in this case is 0.5872, showing that the assumption made by Thorpe and Rücker that  $\alpha=1$  is wanting in generality.—New galvanometric method, by M. Féry. When the torsional couple acting on the suspended portion of the galvanometer is weak, considerable uncertainty is introduced into the results by the uncertainty of the zero. By measuring the angular velocity with which the suspended system starts off, this difficulty is avoided.—On the use of potassium chlorate in explosives of the ammonium nitrate class, by M. H. Le Chatelier. From a solution containing potassium chlorate and ammonium nitrate, crystals of very constant composition and containing 5 per cent. of the former salt can be separated by modifying the temperature and composition of the mother liquor. These crystals, used instead of pure ammonium nitrate in safety explosives, have a greater certainty of detonation.—On the effect of low temperatures upon certain steels, by M. F. Osmond. The results of the experiments upon certain alloys of nickel and iron are in general agreement with those of Dewar and Fleming upon the same subject, the steel acquiring magnetic properties at the temperature of liquid air.—Action of phosphoretted hydrogen upon copper, cuprous oxide, and ammoniacal solutions of copper salts, by M. E. Rubénovitch. Metallic copper reacts with  $\text{PH}_3$  at  $180^\circ\text{--}200^\circ$  giving hydrogen and  $\text{Cu}_3\text{P}$ . Cuprous oxide reacts with the same gas at ordinary temperatures, giving the same copper phosphide and water. Various salts of copper, if treated in ammoniacal solution with hydrogen phosphide, behave differently according to the nature of the salt.—On the aloins, by M. E. Léger. Two distinguishing tests are given for barbaloin, and several derivatives are described prepared from the aloes of Natal.—On some derivatives of the unsymmetrical tetra-methyl-diamidodiphenylethane, by M. A. Trillat.—Study of some substituted diphenyl-anthrone, by M. L. Téty.—On some colour reactions of the oxycelluloses, by M. Edm. Jandrier.—Contribution to the study of mineral waters: on the Croizat spring, near Mont Doré, by M. F. Parmentier. The results of an analysis of the water are given. Iron is absent, but salt and arsenic are present in notable quantities.—On mineral waters containing fluorine, by M. Parmentier. The waters analysed by the author contain no trace of any fluorine compound.—Modification of the respiration of plants produced by varying the temperature, by M. W. Palladine.—On the systematic position of *Trichoslyton* and neighbouring forms in the classification of fungi, by MM. L. Matruchot and Ch. Dassonville.—The coal-bearing strata of the central Pyrenees, by M. Caralp.—Concerning the effect of blood serum in preventing the action of rennet, by MM. L. Camus and E. Gley. Reclamation of priority against M. A. Briot.—Coagulating action of the liquid from the external prostate of the hedgehog on the contents of the seminal vesicles, by MM. L. Camus and E. Gley.—Bunge's law, and the mineral composition of the newly-born infant, by M. L. Hugouennec.—Lesions of the nervous centres in experimental epilepsy of absinthe origin, by M. G. Marinesco.

## DIARY OF SOCIETIES.

THURSDAY, JUNE 15.

ROYAL SOCIETY, at 4.—Prof. A. Michelson will read a Paper.—A Comparison of Platinum and Gas Thermometers at the International Bureau of Weights and Measures at Sévres: Dr. J. A. Harker and Dr. P. Chappuis.—A Preliminary Note on the Life-History of the Organism found in the Tsetse Fly Disease: H. G. Plimmer and Dr. J. Rose Bradford, F.R.S.—The Colour Sensations in Terms of Luminosity: Captain Abney, F.R.S.—On a Quartz-Thread Gravity Balance: R. Threlfall, F.R.S.—On the Orientation of Greek Temples, being the Results of some Observations taken in Greece and Sicily in May 1898: F. C. Penrose, F.R.S.—And other Papers.

LINNEAN SOCIETY, at 8.—Contributions to the Natural History of Lake Urmi and its Neighbourhood: R. T. Günther.—A Systematic Revision

of the Genus *Najas*: Dr. A. B. Rendle.—On the Anatomy and Systematic Position of some Recent Additions to the British Museum Collection of Slugs: Walter E. Collinge.—The *Edwardsia* Stage of Lebrunia, and the Formation of the Oesophagus and Gastro-cœlomic Cavity: J. E. Duerden.

CHEMICAL SOCIETY, at 8.—Ballot for the Election of Fellows.—On the Decomposition of Chlorates, with special reference to the Evolution of Chlorine and Oxygen: W. H. Sodeau.—The Action of Hydrogen Peroxide on Formaldehyde: Dr. A. Harden.—Homocamphoric and Camphonic Acids: A. Lapworth and E. M. Chapman.—Action of Silver Compounds on  $\alpha$ -Dibromocamphor: A. Lapworth.—The Colouring Matter of Cotton Flowers: A. G. Perkin.—Experiments on the Synthesis of Camphoric Acid: H. A. Auden, W. H. Perkin, jun., and J. L. Rose.—Methylisamylsuccinic Acid, Part I.: W. T. Lawrence.

SATURDAY, JUNE 17.

GEOLOGISTS' ASSOCIATION.—Excursion to Lichfield and Cannock. Directors: Prof. C. Lapworth F.R.S., and Prof. W. W. Watts.

MONDAY, JUNE 19.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Exploration between Lake Rudolf and the Nile: Colonel J. R. L. Macdonald, R.E.

VICTORIA INSTITUTE, at 4.30.—Address by the Right Hon. Sir Richard Temple, Bart.

TUESDAY, JUNE 20.

ZOOLOGICAL SOCIETY, at 8.30.—On the Species of Cassowaries: Hon. Walter Rothschild.—On the Remains of a New Bird, *Prapthaethon shrubsolei*, gen. et sp. nov., from the London Clay of Sheppey: C. W. Andrews.—On the Antipatharian Corals of Madeira: J. Y. Johnson.

MINERALOGICAL SOCIETY, at 8.—On the Constitution of the Mineral Arsenates and Phosphates. III. Plumbogummite and Allied Minerals: Mr. Hartley.—Note on Plumbogummite: Prof. Miers.—On a Pyroxene from South Africa: Mr. Bowman.—On the Chemical Composition of Tetraedrite: Messrs. Prior and Spencer.—(1) On a Constituent of the Meteoric Iron of Youndegin, Western Australia; (2) On the Meteoric Stones which fell at Mount Zomba, British Central Africa, on January 25, 1899: Mr. Fletcher.

ROYAL STATISTICAL SOCIETY, at 5.—The Flag and Trade: A. W. Flux.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Retouching: Redmond Barrett.

WEDNESDAY, JUNE 21.

GEOLOGICAL SOCIETY, at 8.—Agglomerates, Ashes, and Tuffs in the Carboniferous Limestone Series of Congleton Edge: Walcott Gibson and Wheelton Hind.—Ironstone Fossil Nodules of the Lias: E. A. Walford.—Additional Notes on the Glacial Phenomena of Spitsbergen: E. J. Garwood.

ROYAL METEOROLOGICAL SOCIETY, at 4.30.—Heavy Falls of Rain recorded at the Observatories connected with the Meteorological Office, 1871–98: Robert H. Scott, F.R.S.—Average Height of the Barometer in London: R. C. Mossman.—A New Self-recording Anemoscope: Joseph Baxendell.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Notes on some Sponges belonging to the Clonidæ obtained at Madeira: J. Y. Johnson.

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